

AMENDMENTS TO THE CLAIMS

1. (Cancelled)

2. (Currently Amended)

1 The restrictor and pipe combination of claim [[1]] 24 wherein said restrictor body
2 is constructed entirely of plastic material injection molded in final form.

3-4 (Cancelled)

5. (Currently Amended)

1 The restrictor and pipe combination of claim [[1]] 25 wherein said pipe comprises
2 a rubber composite hose and wherein the external surface of ~~the~~ said restrictor is of constant
3 diameter and is interrupted in a central region axially thereof by a series of grooves and
4 intervening lands with sharp intersections, said grooves being of relatively shallow radial depth
5 to thereby adapt the restrictor for being surrounded by said hose clamped thereto and sealed by
6 engagement with the grooves and lands of the inner wall of the hose.

6-10 (Cancelled)

11. (Currently Amended)

1 The combination of claim [[6]] 26 wherein said first restrictor is coupled at its
2 outlet in fluid communication with the inlet of a tuning cable conduit extending co-axially with
3 said first hose section downstream of said restrictor outlet in inwardly spaced relation to a said
4 surrounding interior wall of said first hose section.

12. (Original)

1 The combination of claim 11 wherein said restrictor and said tuning cable conduit
2 are each made of plastic material and are coupled by being telescopically joined and plastically
3 welded together.

13-14 (Cancelled)

15. (Currently Amended)

1 A method of eliminating turbulence-induced hiss-like noise and/or heat in a
2 pulsation-absorbing flexible pipe for a pressure fluid device adapted to be connected between a
3 pressure fluid-feeding device and a working device operated by the pressure fluid discharged
4 from the pressure fluid-feeding device wherein the flexible pipe has a restrictor positioned inside
5 the bore of the flexible pipe between the ends of said flexible pipe and having a flow-through
6 bore,

7 said method comprising the step of:

8 (a) providing said restrictor as a venturi restrictor wherein the flow-through
9 bore in said restrictor has a venturi tube cross section with a tapered

flow-direction-convergent inlet bore leading to a constant diameter throat which in turn leads to a tapered flow-direction-divergent outlet, and

(b) designing said venturi inlet, throat and outlet so as to conduct fluid therethrough in the operating system of said pressure fluid device by matching the characteristics of the fluid, the operational pressures, fluid density and other system parameters such that the venturi operates below the lower critical value of the Reynolds number of the fluid flow through the restrictor to thereby minimize or eliminate turbulence-generated hiss-like noise and/or heat by minimizing or eliminating turbulence in the fluid in the restrictor outlet and/or exiting immediately downstream from the venturi restrictor and,

(c) providing said restrictor to thereby accomplish steps (a) and (b) with a cylindrical exterior surface having an outside diameter (O.D. dimension) generally ranging from about 10.033 mm down to about 8.76 mm, wherein the axial cross sectional configuration of the interior of the restrictor, as defined by said inlet, throat and outlet passages, is symmetrical about all axes, wherein the respective taper angle of said inlet and outlet passages is in the range of about 4° to about 15°, wherein the internal diameter dimension of said throat passage is in the range of about 2.64 mm to about 4.57 mm, wherein the axial length of said throat passage is in the range of about 0.76 mm to about 12.2 mm, and wherein

32 the maximum I.D. of said inlet passage at its inlet end is the same as that
33 of said outlet passage at its outlet end and is about 7.493 mm.

16-19 (Cancelled)

20. (Original)

1 The method of claim 15 wherein said flexible pipe comprises a hose section and
2 said restrictor is coupled at its outlet in fluid communication with the inlet of a tuning cable
3 conduit extending co-axially with said hose section downstream of said restrictor outlet in
4 inwardly spaced relation to a surrounding interior wall of said hose section, and wherein said
5 restrictor and said tuning cable conduit are each made of plastic material and are coupled by
6 being telescopically joined and plastically welded together.

21-23 (Cancelled)

24. (New)

1 In combination, a restrictor and a pulsation-absorbing flexible pipe for a pressure
2 fluid device, said restrictor comprising a generally cylindrical body having a central flow-
3 through passage open at its opposite axial ends, said flow-through passage being constructed in
4 the form of a venturi having a flow-direction-convergent inlet passage leading into a constant
5 diameter throat passage that in turn leads into a flow-direction-divergent outlet passage, the
6 configuration of said venturi inlet, throat and outlet passages being constructed and arranged
7 with a shallow taper angle in said inlet and outlet passages and said throat passage having a

8 relatively short axial length much less than that of either said inlet or said outlet passages and
9 such that turbulence is minimized in said restrictor outlet passage and/or immediately
10 downstream thereof, under the pressure and fluid flow conditions in which the restrictor is
11 adapted to be used,

12 said body having a cylindrical exterior surface with an outside diameter (O.D.
13 dimension) generally ranging from about 10.033 mm down to about 8.76 mm, wherein the axial
14 cross sectional configuration of the interior of the restrictor, as defined by said inlet, throat and
15 outlet passages, is symmetrical about all axes, wherein the respective taper angle of said inlet and
16 outlet passages is in the range of about 4° to about 15°, wherein the internal diameter dimension
17 of said throat passage is in the range of about 2.64 mm to about 4.57 mm, wherein the axial
18 length of said throat passage is in the range of about 0.76 mm to about 12.2 mm, wherein the
19 maximum I.D. of said inlet passage at its inlet end is the same as that of said outlet passage at
20 its outlet end and is about 7.493 mm, wherein the external surface of said restrictor is interrupted
21 in its central region by a series of shallow grooves that define therebetween a series of equally
22 spaced and equal axial length lands, the axial length dimension of each said groove being in the
23 range of about .127 mm to about 1.651mm, the axial length dimension of each said land being in
24 the range of about .76 to about 2.667 mm, and wherein the depth dimension of each said groove
25 being in the range of about .127 mm to about 406 mm.

25. (New)

1 In combination, a restrictor and a pulsation-absorbing flexible pipe for a pressure
2 fluid device, said restrictor comprising a generally cylindrical body having a central flow-

3 through passage open at its opposite axial ends, said flow-through passage being constructed in
4 the form of a venturi having a flow-direction-convergent inlet passage leading into a constant
5 diameter throat passage that in turn leads into a flow-direction-divergent outlet passage, the
6 configuration of said venturi inlet, throat and outlet passages being constructed and arranged
7 with a shallow taper angle in said inlet and outlet passages and said throat passage having a
8 relatively short axial length much less than that of either said inlet or said outlet passages and
9 such that turbulence is minimized in said restrictor outlet passage and/or immediately
10 downstream thereof, under the pressure and fluid flow conditions in which the restrictor is
11 adapted to be used,

12 said body having a cylindrical exterior surface with an outside diameter (O.D.
13 dimension) generally ranging from about 10.033 mm down to about 8.76 mm, wherein the axial
14 cross sectional configuration of the interior of the restrictor, as defined by said inlet, throat and
15 outlet passages, is symmetrical about all axes, wherein the respective taper angle of said inlet and
16 outlet passages is in the range of about 4° to about 15°, wherein the internal diameter dimension
17 of said throat passage is in the range of about 2.64 mm to about 4.57 mm, wherein the axial
18 length of said throat passage is in the range of about 0.76 mm to about 12.2 mm, and wherein
19 the maximum I.D. of said inlet passage at its inlet end is the same as that of said outlet passage
20 at its outlet end and is about 7.493 mm.

26. (New)

1 A hydraulic power steering system having a hydraulic power steering pump with
2 its input communicating with the output of a power steering gear via a first hose section operable
3 as a pulsation absorbing flexible fluid return line in said system, a first flow restrictor being

combined with said system and operable in the low pressure side thereof as a pressure balancing restrictor installed in said first hose section,

said hydraulic pump having its output communicating with the input of said power steering gear via a second hose section constructed as a pulsation-absorbing pressure fluid delivery hose, a second flow restrictor operably disposed in said second hose section and operable for damping pressure waves in the high pressure side of said system,

said first restrictor comprising a generally cylindrical body having a central flow-through passage open at its opposite axial ends, said first restrictor flow-through passage being constructed in the form of a venturi having a flow-direction-convergent inlet passage leading into a constant diameter throat passage that in turn leads into a flow-direction-divergent outlet passage, the configuration of said venturi inlet, throat and outlet passages being constructed and arranged with a shallow taper angle in said inlet and outlet passages and said throat passage having a relatively short axial length much less than that of either said inlet or said outlet passages and such that turbulence is minimized in said restrictor outlet passage and/or immediately downstream thereof under the system pressure and fluid flow conditions,

said first hose section comprising a flexible compliant hose section having an interior wall defining a fluid conducting passage extending from a first end to a second end of said first hose section and having a predetermined inner diameter, said wall being formed of a compliant material permitting volumetric expansion of said passage in response to an increase in pressure in the fluid,

said first flow restrictor being operably disposed in said hose section between said passage ends for communicating fluid flowing therein from said first end to said second end of said hose section via said first restrictor flow-through restrictor passage, said venturi throat

27 having a diameter smaller than said inner diameter of said hose section to thereby restrict
28 alternating pressure components of said fluid flow between said ends of said hose section, and
29 wherein the taper angle of said venturi outlet passage ranges between approximately 4° up to
30 approximately 15°, said venturi restrictor inlet, throat and outlet passages thus being configured
31 to operate as a non-turbulent flow venturi under the conditions existent in the operation of the
32 hydraulic system to thereby reduce or eliminate heat and/or audible hiss-like noise.